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AUTHOR Gever, Benson E.; Weisberg, Robert W.
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ABSTRACT

This investigation gives attention to the developmental course and influence of social class on self-directed, private speech. The Ss were 108 white, middle and lower class pre-school, first and third grade children. Two measures of receptive vocabulary were administered as background language measures. The experimental task required S to sort pictures of common objects into categories at three levels of task difficulty. The results indicated a rather marked decline in spontaneous verbalization from the pre-school to first grade levels with no significant change between the first and third grade levels. A parallel trend was found in the decreasing intensity level of the speech productions (i.e., a simultaneous decrease in overt vocalization and increase in silent lip-movement activity). These findings support Vygotsky's internalization hypothesis. A significant association was not found between the frequency of verbalization and problem solving performance, which casts doubt on the directive function of such verbal activity. Prominant social class differences in cognitive-linguistic abilities were also found. These differences may stem from the differential linguistic codes attributed to the middle and lower class patterns of verbal interaction. (Author/CJ)

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Benson E. Gever
Institute for Learning
Hahnemann Medical College and Hospital
1505 Race Street
Philadelphia, Pa. 19102

and

Robert W. Weisberg
Temple University
Broad and Montgomery Avenues
Philadelphia, Pa. 19122

September, 1970

U.S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

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Bureau of Research

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Summary

The purpose of this investigation was to assess the cognitive relevance of children's spontaneous verbalizations during problem solving. Additional attention was given to the developmental course and influence of social class on self-directed, private speech. The interest in social class was based on reports which suggested an association between social class linguistic codes, styles and interaction and the development of verbal mediational abilities in young children.

The Ss used in this investigation were 108 white, middle and lower class pre-school, first and third grade children. Two measures of receptive vocabulary were administered as background language measures. The experimental task required S to sort pictures of common objects into categories at three levels of task difficulty. In addition to the measures of verbal and non verbal sorting performance, all spontaneous verbalizations were recorded and classified during the solution period.

The results indicated a rather marked decline in spontaneous verbalization from the pre-school to first grade levels with no significant change between the first and third grade levels. A parallel trend was found in the decreasing intensity level of the speech productions (i.e., a simultaneous decrease in overt vocalization and increase in silent lip-movement activity). These findings may be taken as support for Vygotsky's internalization hypothesis. The effect of task difficulty was seen in the increasing level of verbalization from tasks of easy to moderate difficulty. Only the middle class, third grade Ss showed a commensurate increase in verbalization at the most difficult level. Such fluctuations in verbalization as a function of task difficulty have often been taken as support for the notion that nonsocial speech is a cognitively relevant dimension of thinking and problem solving. However, a significant association was not found between the frequency of verbalization and problem solving performance, which casts doubt on the directive function of such verbal activity. An alternate explanation was that the nonsocial

speech was, at most, expressive of underlying thought; the greater frequency and externalization at the younger age levels may result from a combination of general maturational-developmental factors and cognitive challenge which serve to diminish inhibitory control.

Prominent social class differences in cognitive-linguistic abilities were also found. The results of the background language measures lent some support to a "cumulative deficit" hypothesis with regard to receptive vocabulary development. However, all the abilities were not equally affected. Also, the middle class Ss produced more task-related spontaneous verbalization than their lower class age-mates. These differences in expressive language may very well stem from the differential linguistic codes attributed to the middle and lower class patterns of verbal interaction. However, the specific relationship between verbal productivity and problem solving or more general cognitive development remains a question for future research.

Contents

	Page
Introduction	1
Method	5
Objectives	5
Subjects	5
Conceptual Sorting Task	6
Procedure	8
Description of Dependent Variables	8
Results	10
Social Class Differences in Cognitive-Linguistic Abilities	10
Age Trends in Spontaneous Verbalization	13
Effects of Task Difficulty on Spontaneous Verbalization	16
Correlational Analysis	18
Discussion	20
Social Class Differences	20
Spontaneous Verbalization and Problem Solving	21
Conclusion	26

List of Tables

1. Chronological and Mental Age Scores Derived from Background Language Measures for Middle and Lower Class, Pre-School, First and Third Grade Ss . . . 11

2. Mean Verbalization Scores for Middle and Lower Class Pre-School, First and Third Grade Ss at Three Levels of Task Difficulty 14

3. Analysis of Variance of Effects of Social Class, Grade and Task Difficulty on Spontaneous Verbalization Transformed Scores 15

4. Intercorrelations (Rank Order) Between Peabody Picture Vocabulary Test (PPVT), Auditory Receptive Subtest (AR), Spontaneous Verbalization Scores (SV), Non Verbal Sorting Performance (SP), and Statements of a Verbal Principle (VP), at Grade and Social Class Levels 19

List of Figures

Page

1. Effects of social-class on statements of a verbal principle at three grade levels 13

2. Mean percent of verbalization for categories of spontaneous verbalization at three grade levels 16

3. Effects of task difficulty on spontaneous verbalization at three grade levels 17

4. Effects of social class on spontaneous verbalization at levels of task difficulty for third grade group 18

INTRODUCTION

There is mounting evidence to suggest that important transitions take place in childrens' cognitive-linguistic abilities, at about the time they begin school, which alter their basic problem solving strategies (Kendler and Kendler, 1962; White, 1966). It is felt that one major determinant of this developmental process has to do with the child's increasing tendency to produce and employ relevant language cues which seemingly direct or mediate his instrumental activities. While the thrust of this thinking seems intuitively promising, it almost immediately leads to the heart of the language-thought question which poses numerous methodological problems. Some investigators have approached this area by inferring underlying linguistic mediation on the basis of the differential problem solving strategies of "verbal" and "non-verbal" subjects (Kendler, 1963; Kendler and Kendler, 1970). Another and, perhaps, more desireable approach seeks to observe directly the production of cognitively relevant language cues (Flavell, Beach, and Chinsky, 1966).

One technique for studying the function of language in problem solving, consistent with the latter approach, focuses on the non-social speech productions of young children. Piaget's (1947) early observations of childrens' speech, in isolation and in peer settings, suggested to him that much of their speech activity was primarily speech-for-self and lacked communicative intent. He found that five- and six-year olds engaged in a rather high proportion of speech which accompanied activity but seemed to serve no social or cognitive function. Piaget called such speech "egocentric." The proportion of egocentric speech (co-efficient of egocentricity) ranged from .40 to .70 in the children Piaget observed. Egocentric speech was seen as a reflection of the child's undifferentiated, self-centered orientation which steadily declined with developmental advancement. Piaget's later treatment of the language issue further de-emphasized its primary role in the thinking process (Piaget, 1967).

While Vygotsky (1962) similarly observed the non-social or private speech activity of young children, he asserted that much of this early, overt vocalization had a clearly self-guiding function; it served as an instrumental cognitive tool in problem solving. Vygotsky felt that the overt vocalizations were the precursors of verbal thought in the adult. Speech-for-self is simultaneously condensed and internalized, a process which culminates sometime during adolescence. According to Vygotsky, the decline in this category of speech is not merely the dropping out of a primitive, transitionary form of egocentric language, but is an index of the development of a self-stimulating system of verbal symbols intimately connected with the child's thinking. The cognitive function of private speech was further suggested by findings which indicated greater output corresponding to increases in task difficulty (Vygotsky and Luria, 1930).

Flavell, et al. (1966) reported results which indicated to them the need for a more complex restatement of the Vygotsky hypothesis. They found, for example, that among children working on a recall task, spontaneous verbal rehearsal did not necessarily decrease in the older children. In fact, verbalization, while uttered at a very low intensity level (i.e., barely detectable lip movement), increased from the first to fifth graders. Flavell and his associates were in accord with the general finding that increasing age results in a decline in the intensity of verbalization which is consistent with the internalization hypothesis. They did, however, raise questions regarding the influence of individual differences and the nature and difficulty of the task on Vygotsky's assumptions regarding age changes in spontaneous verbalization. For example, increases in the difficulty factor may very well interact with any developmental trend toward a reduction in the frequency and intensity of spontaneous verbalization.

More recently support has been given to the Vygotsky position by Kohlberg and his associates (Kohlberg, Yaeger, and Hjertholm, 1968). They reported findings which indicated that private or nonsocial speech is positively related to independent estimates of I.Q. at early age levels,

becomes internalized with cognitive advancement, and directly varies with the cognitive demands of the task. Kohlberg further organized a theoretical framework to deal with the developmental hierarchy of nonsocial speech categories in terms of their cognitive utility. Five levels and seven types of private speech were defined.

While Kohlberg and his associates have attempted to clarify inconsistencies regarding the multiple forms and functions of private speech, their research directed toward verification of Vygotsky's notions remains sketchy and inconclusive. More specifically, the issue of the cognitive utility of young childrens' speech-for-self needs more clarification. This question has primarily been approached by two kinds of empirical strategies. First, there has been an attempt to demonstrate that nonsocial speech varies as a function of alterations in task difficulty. While there was some evidence to support this general relationship, there has been no clear demonstration of a systematic relationship between variations in spontaneous verbalization and the cognitive demands of problem solving. Second, there have been attempts to demonstrate a positive association between spontaneous verbalization and cognitive development or general estimates of I.Q. Surprisingly, there has been little research directed toward relating the use of self-directed speech to measures of specific problem solving performance.

With these issues in mind the present study has attempted to apply systematically both of these research strategies in investigating the cognitive utility of spontaneous verbalization. The problem-solving technique employed was a structured sorting task (i.e., S matched stimuli with a model as opposed to a "free sort") designed to provide children with easy-to-label stimuli. Similar to other investigations of concept sorting, both verbal and "nonverbal" measures of performance were evaluated. However the major interest was in determining whether childrens' self-directed speech facilitated their problem solving performance.

If, indeed, self-directed speech is a relevant dimension of problem solving success, then it follows that children who are less inclined to verbalize are more generally handicapped in their cognitive efforts. This kind of thinking has already led educators to develop a number of compensatory programs for "socially disadvantaged" children which deal almost exclusively with language stimulation and enrichment (Brottman, 1968). Justification for such programming stems from social class analyses of communication styles which are primary determinants of verbal behavior. Lower class verbal interactions, particularly with regard to the mother-child relationship, have been characterized as "restricted" in the sense that they do not provide the child with ample opportunities and rewards for the reflective and elaborative functions of language (Bernstein, 1960). Whether or not these limitations in language noted in lower class children are directly responsible for more general cognitive and problem solving lags leads once again to the puzzling language-thought question.

The present study attempted to replicate the influence of social class on spontaneous verbalization, as well as some of the basic trends reported by Kohlberg et al. (1968) regarding the use of spontaneous verbalization by young children in a problem solving setting. The major questions raised were as follows:

1. What changes occur in task-related spontaneous verbalization as a function of age?

2. Is spontaneous verbalization a cognitively relevant dimension of problem solving?

   a. Are there changes in production as a function of variations in the conceptual demands of the task?
   b. Does verbalization facilitate problem solving performance?

3. Are there differences in spontaneous verbalization as a function of social class, specifically during problem solving?

METHOD

Objectives:

The major objective of this study was to determine the effects of age, social class, and task difficulty on the spontaneous, task-related verbalizations of children while performing a classificatory problem solving task. The secondary objectives involved a consideration of additional verbal and nonverbal performance measures which were related to the experimental task. The dependent variables were as follows:

1. A nonverbal measure of sorting performance;
2. All relevant spontaneous speech activity uttered during the solution period;
3. Verbal explanations or principles for sorting performance.

Two measures of receptive language development were administered to provide background information regarding the linguistic competency of the Ss used in this investigation. The Peabody Picture Vocabulary Test (Dunn, 1959), and the Auditory Receptive Subtest of the Illinois Test of Psycholinguistic Abilities - Revised Edition (Kirk, McCarthy, and Kirk, 1968) were selected because of the applicability of their norms to the age groups under investigation and their extensive use in previous research.

Subjects:

Initially, the most recently published census tract data (1960) were used to define middle and lower socio-economic communities based upon income, housing information, and employment status. The Kensington section of Philadelphia was identified as a focal area for selection of the lower class samples. The housing value range for this area extended from $5,000 to $7,400 with a mean value of $5,900. Yearly income ranged from $4,310 to $6,225 with a median income of $5,800. The median number of school years completed was 8.8 and the mean population per household was 3.37.

The ratio of blue collar to white collar employment status was approximately 2 or 3 to 1.

After consultation with the district supervisor of schools for this area, two elementary schools and an adjacent Get Set Center were selected as target schools for sampling procedures.

The middle class sample was drawn from one elementary school and a private nursery program located within a suburban area of Philadelphia. The 1960 reported median income for this area was $8,575. The median number of school years completed was 12.4 and the mean population per household was 3.34. A cursory inspection of the students' cumulative records indicated that the fathers of most of these children were employed in white collar or professional positions. The most typical occupations were salesman, engineer, teacher, and various forms of business administrator.

Within each social class group 18 Ss and 4 alternates were randomly selected at each of the following levels: preschool, first grade, and third grade. Males and females were equally distributed within each cell.

The mean chronological ages and language scores for each group are presented in Table 1 (p. 11). There were no significant age differences between social class groups at any grade level (t test for differences between means).

Conceptual Sorting Task:

The Conceptual Sorting Task consisted of 36 ink representations of common objects mounted on cardboard and coated in plastic. The drawings represented objects which fit into categories at three levels of difficulty. There were four stimuli per category and four categories per level. The levels were designed to represent variations in sorting difficulty. Several pilot studies were undertaken to assure an appropriate calibration of the levels where the number of correct sorting choices was used as the difficulty criterion.

Level I consisted of stimuli designed to elicit common labels from children within each category. That is, while there were four variations within each category, it was felt and generally substantiated in the pilot work, that Ss would apply the same label to each stimulus in the category. For example, if a child is shown a picture of a pine, fir, and maple tree, he will tend to name each as "tree" with no further specification.

The categories were: Trees, Dogs, Flowers, and Houses.

Level II consisted of categories of stimuli which were designed to elicit differential labels apart from the overriding categorical label. For example, if a child is shown a picture of an eye, foot, and hand, he will tend to identify them as such rather than apply a categorical term, such as "parts of the body." The necessity to discover a principle of classification apart from the stimulus label makes this a more difficult task than Level I. The categories were:

Clothes	Tools	Parts of Body	Furniture
1. pants	1. saw	1. foot	1. bed
2. dress	2. scissors	2. eye	2. chair
3. shoe	3. hammer	3. hand	3. table
4. shirt	4. screw driver	4. ear	4. sofa

Level III, in principle, was identical to Level II except that more difficult categories were selected. They were:

Communication	Fasteners	Lights	Containers
1. telephone	1. nail	1. lamp	1. can
2. television	2. button	2. matches	2. bottle
3. book	3. safety pin	3. light bulb	3. table
4. letter	4. hook	4. candle	4. sofa

Procedure:

Each S was seen individually for two test sessions. The Conceptual Sorting Task was administered by one of two female graduate students in psychology who had some previous experience in recording spontaneous speech data. Each E was assigned an equal number of Ss from each sex, age, and social class group with the exception of the middle class preschool group. Because of time limitations incurred by one E, the second E tested all Ss in this cell. S was seated across a table from E so that muttering and lip movement could be recorded. The background language tests were administered in random order during the second test session, approximately a day later, by the author.

The Conceptual Sorting Task was administered to each S as follows: Each S sorted the materials at each level of difficulty. At every level, four model stimuli; one from each category, were placed on the table before the subject. The remaining stimuli were shuffled and handed to S. He was then asked to place each card in the deck with the most appropriate model.

Directions: "Here are some pictures (E points to each model in turn). Here are some more pictures (E hands S the deck of shuffled stimuli). Some are like this one, some are like this one, etc. (E once again points to each model). Put each picture with the one that it is like or put the picture where it belongs (depending upon S's comprehension of directions).

There were two sorts at each level of difficulty and the materials were reshuffled after each presentation. Two independent measures of verbalization were obtained as well as a measure of S's nonverbal performance.

Description of Dependent Variables:

Spontaneous Verbalization (SV). All spontaneous speech production was recorded by hand, including subvocalized muttering and lip-movement activity. Es were

instructed to parenthesize all comments which, in their judgment, reflected social intent. Such comments, including questions and requests for help, as well as extraneous conversation with E not related to the task, were omitted from the tabulation of the spontaneous verbalization frequencies.

Task-related, spontaneous verbalization, then, was simply defined as the total number of self-communicative comments uttered during the solution of the sorting task. Additionally, each verbalization was placed in one of the two following categories:

External Speech. Self-directed speech which could be heard and comprehended by E within the task setting.

Internalized Speech. Speech uttered at low intensity levels, including incomprehensible muttering and inaudible lip-movement. While evidence for internalization might also be inferred from increased condensation and self-direction of speech, only the reduced intensity level was used as a measure of internalized verbalization in this study.

Reliability of Spontaneous Verbalization. Coder agreements between one E and the author were obtained on an independent sample of 18 Ss. Pearson product-moment correlation for the spontaneous verbalization frequencies revealed a reliability coefficient of .94. Rank order correlations between classifications of spontaneous verbalizations into subcategories were as follows: External speech, .99; Muttering, .91; Lip-Movement, .89.

Verbal Principle (VP). After sorting the stimuli S was asked why the pictures in each category were alike or why they belonged together. Responses were classified and assigned a numerical rating as follows:

Non-Conceptual (Score 1). Absence of any response, or responses which gave no indication of a relationship between the stimuli were placed in this category. Examples of non-relational responses included stimulus labeling and unelaborated assertions of similarity (e.g., "They're all the same.").

Pre-Conceptual (Score 2). Partial, distorted, or overgeneralized responses were placed in this category. Conceptual chaining and fragmentation were often employed at this level. [e.g., "You can use them all" (tools); "You eat on the chair and the table"; "They (lights) all have electricity"].

Conceptual (Score 3). This category included responses which clearly represented an appropriate principle for categorization regardless of whether it was based upon a common physical attribute (e.g., "They have metal"), function (e.g., "You fix things with them"), or overriding generic label (e.g., "They're tools").

Sorting Performance (SP). The sum of the correct placements of stimuli into categories was calculated for each S.

RESULTS

Social Class Differences in Cognitive-Linguistic Abilities

To assess the linguistic competence of the Ss used in this study, two standardized measures of receptive vocabulary development were administered. The results of these background measures are presented in Table 1.

TABLE 1

CHRONOLOGICAL AND MENTAL AGE SCORES DERIVED FROM BACKGROUND LANGUAGE MEASURES FOR MIDDLE AND LOWER CLASS, PRE-SCHOOL, FIRST, AND THIRD GRADE Ss.

GRADE LEVEL	Chronological Age		Mental Age Scores			
			PPVT		Auditory Receptive (ITPA)	
	Mean	SD	Mean	SD	Mean	SD
Middle Class						
Pre-school	53.8	2.7	60.7	9.2	60.1	9.1
First	77.3	4.2	91.2	16.8	95.6	16.1
Third	99.4	2.9	114.3	16.2	116.9	7.7
Lower Class						
Pre-school	53.8	5.3	45.3	12.4	50.7	7.6
First	74.7	3.8	71.2	16.7	69.9	17.0
Third	99.1	3.6	91.1	14.1	83.9	9.7

This table indicates rather dramatic differences in the acquisition of receptive vocabulary abilities between the lower and middle class groups. As expected, middle class Ss performed significantly better on both the Auditory Receptive subtest of the Illinois Test of Psycholinguistic Abilities ($F = 73.32$, $df = 1/102$, $p < .01$) than the lower class Ss. Additionally, the social class differences in receptive language competence increase with age. However, while the age x social class interaction was significant for the Auditory Receptive subtest ($F = 6.91$, $df = 2/102$, $p < .05$), there was no comparable interaction for P.P.V.T. performance. Thus, one of these two language variables supports the so-called "cumulative deficit hypothesis."

It was also suspected that significant social class differences would be found in the S's sorting performance and task-related verbalizations. Again, the middle class Ss performed more effectively. There was a significant social class difference for the nonverbal sorting performance ($F = 15.73$, $df = 1/102$, $p < .01$). Similar social class differences were found for the verbal measures. Lower class Ss did not verbalize as frequently as middle class Ss during the solution period ($F = 7.91$, $df = 1/102$, $p < .01$) and were less effective in expressing a verbal principle for their sorting performance ($F = 29.74$, $df = 1/102$, $p < .01$).

There was also a significant age x social class interaction on the statements of a verbal principle ($F = 4.82$, $df = 2/102$, $p < .01$). The direction of this interaction (See Figure 1) is consistent with the trends noted on the background language data, namely, that social class differences increase with age. That is, while there was no significant difference in verbal explanations at the pre-school level, the middle class subjects were significantly more effective than lower class Ss at stating a rule for their classifications at the first ($F = 19.19$, $df = 1/102$, $p < .01$) and third grade levels ($F = 19.79$, , $df = 1/102$, $p < .01$).

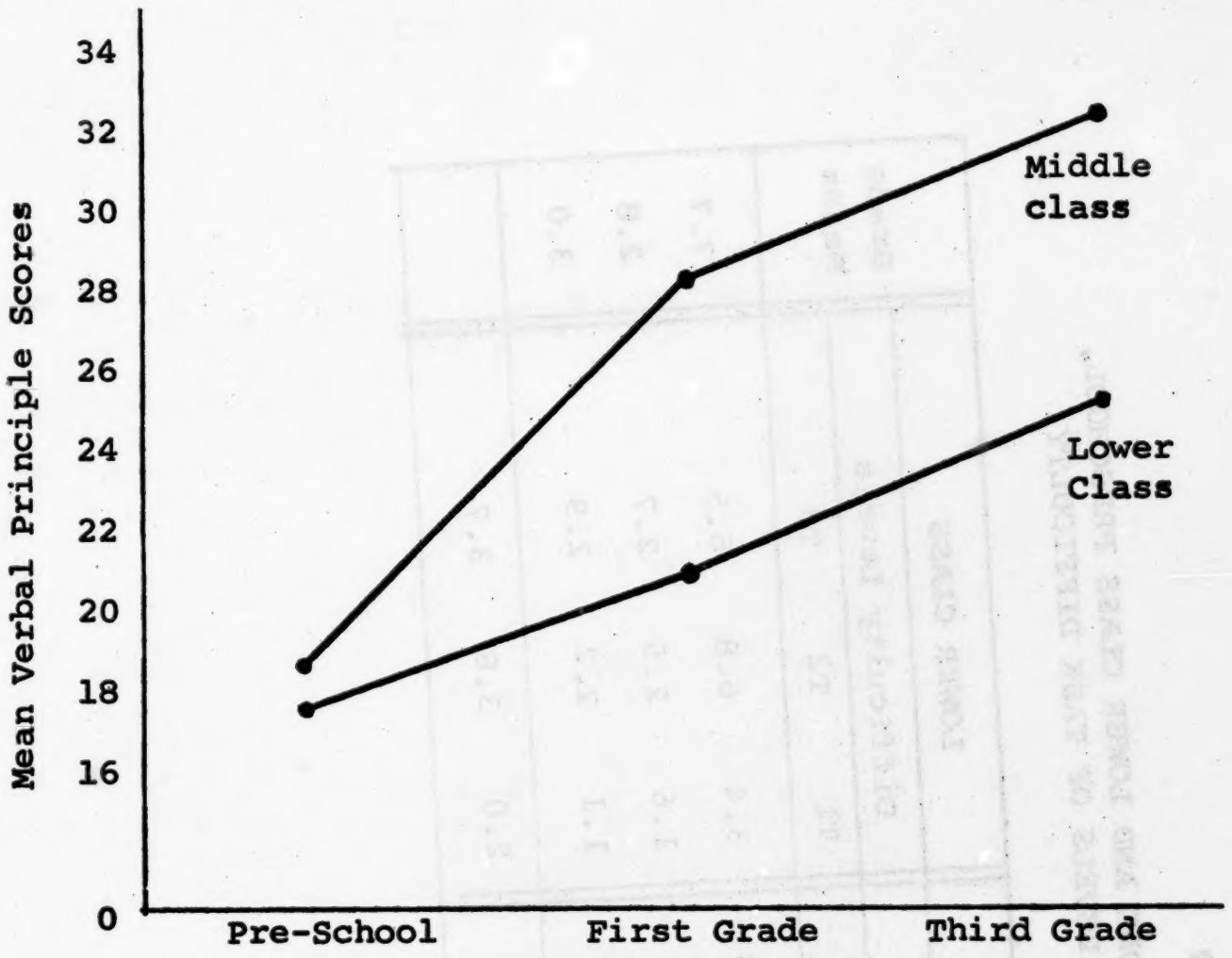

Figure 1. Effects of social-class on statements of a verbal principle at three grade levels.

These findings, then, offer consistent evidence that lower class children are less productive in both the verbal and nonverbal elements of problem solving than their middle class age-mates. The notion that such differences increase with age was partially supported; however, all abilities are not equally affected.

Age Trends in Spontaneous Verbalization (SV)

According to Vygotsky, spontaneous verbalization should decrease and become more internalized with increasing age. The results (See Table 2) are in the predicted direction. While there was little change in the absolute number of Ss who verbalized at each grade level, there were marked transitions in the quantity and form of the non-social speech utterances. An analysis of variance for the transformed spontaneous verbalization frequencies ($SV' = \sqrt{x} + \sqrt{x+1}$) indicates a significant main effect for age (See

TABLE 2

MEAN VERBALIZATION SCORES FOR MIDDLE AND LOWER CLASS PRESCHOOL, FIRST AND THIRD GRADE Ss AT THREE LEVELS OF TASK DIFFICULTY.

Grade Levels	MIDDLE CLASS			LOWER CLASS			Grade Means
	Difficulty Levels			Difficulty Levels			
	T1	T2	T3	T1	T2	T3	
Preschool	8.9	11.0	10.3	3.4	6.8	5.5	7.7
First	1.3	4.3	4.4	1.6	2.5	2.7	2.8
Third	1.7	3.5	6.4	1.1	2.2	2.9	3.0
Means	3.9	5.9	7.0	2.0	3.8	3.7	

TABLE 3

ANALYSIS OF VARIANCE OF EFFECTS OF SOCIAL CLASS, GRADE AND TASK DIFFICULTY ON SPONTANEOUS VERBALIZATION TRANSFORMED SCORES

Source of Variance	df	MS	F
Between Subjects			
Social class	1	83.82	7.91**
Grade	2	102.53	9.67**
Social class x Grade	2	8.45	.78
Error (between)	102	10.60	
Within Subjects			
Task difficulty	2	46.58	31.68**
Social class x task difficulty	2	3.22	2.19
Age x task difficulty	4	4.67	3.18*
Social class x task difficulty x grade	4	4.17	2.84*
Error (within)	204	1.47	

* $p < .05$
** $p < .01$

Table 3). A Newman-Keuls test (Winer, 1961) indicated that there was a significant decrease ($p < .05$) in verbalization from the pre-school to first grade levels, but no significant difference between the first and third grade levels. A parallel transition was noted for the form of the verbalizations. The proportion of external to internalized forms of speech (i.e., forms uttered at lower intensity levels, such as muttering and lip-movement) shifted in the direction of greater internalization with increasing age, and again the most marked change occurred between the pre-school and first grade levels (8.67 to 0.38). However, Figure 2 displays the age changes in the three categories of speech defined in this study.

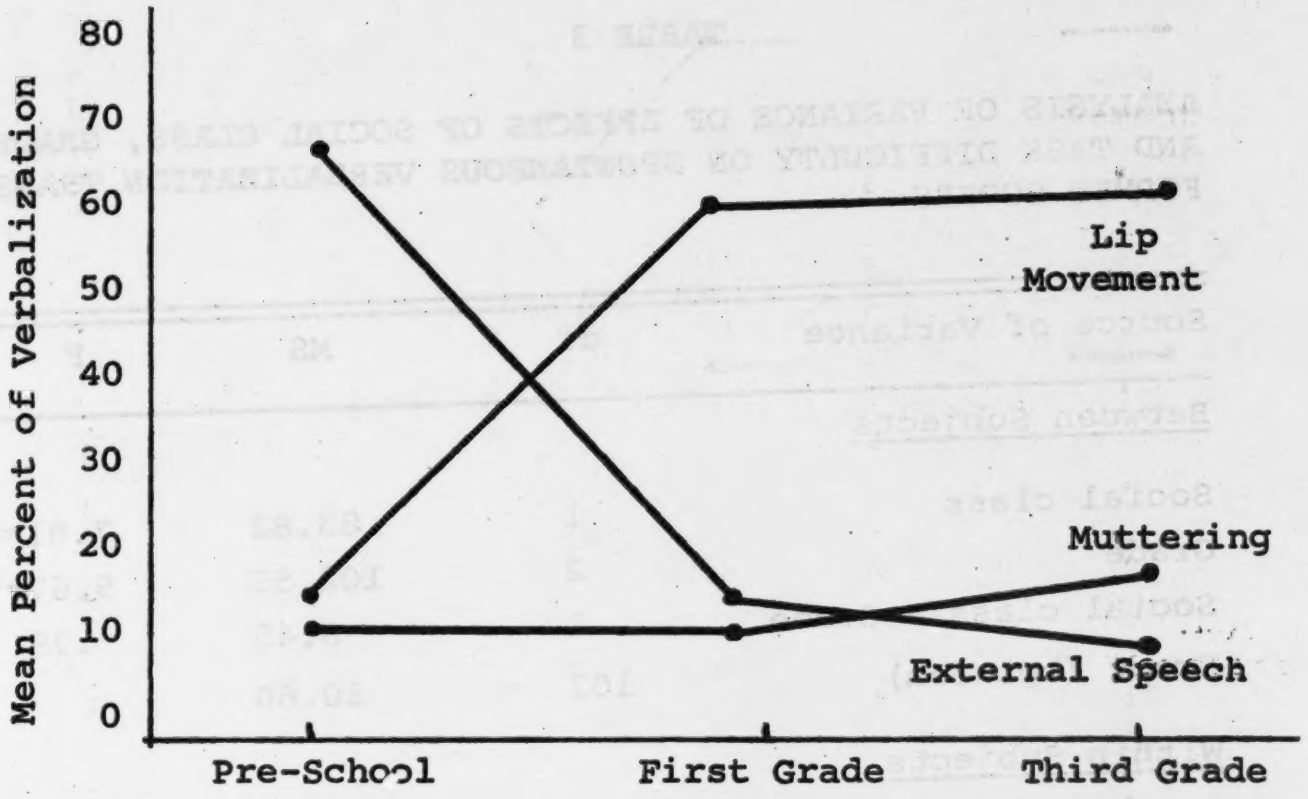

Figure 2. Mean percent of verbalization for categories of spontaneous verbalization at three grade levels.

It is evident that the shift toward what has been defined as "internalized" verbalization is primarily due to a simultaneous decrease in external speech and an increase in lip-movement from the pre-school to first grade level. There were negligible changes in muttering activity across the three grade levels.

In summary, the frequency of spontaneous verbalization decreased with age, with a commensurate shift toward more internalized speech forms. The most notable developmental transitions occurred between the pre-school and first grade levels.

Effects of Task Difficulty on Spontaneous Verbalization.

The notion that spontaneous verbalization is an index of cognitive activity suggests that spontaneous verbalization would vary in accordance with the cognitive demands

of the task. Table 3 indicates that there were significant changes in spontaneous verbalization as a result of the task difficulty factor. Overall, the greatest increase occurred from T1 to T2, with no significant difference between T2 and T3 (Newman Keuls tests). The effect of task difficulty was not consistent across age levels. While Figure 3 indicates that pre-schoolers did the most talking at T2, the decline at T3 was not significant. Similarly, first graders talked more at T2 and T3 than at T1. And, finally, the third graders evidenced a progressive increase in speech activity from T1 to T3.

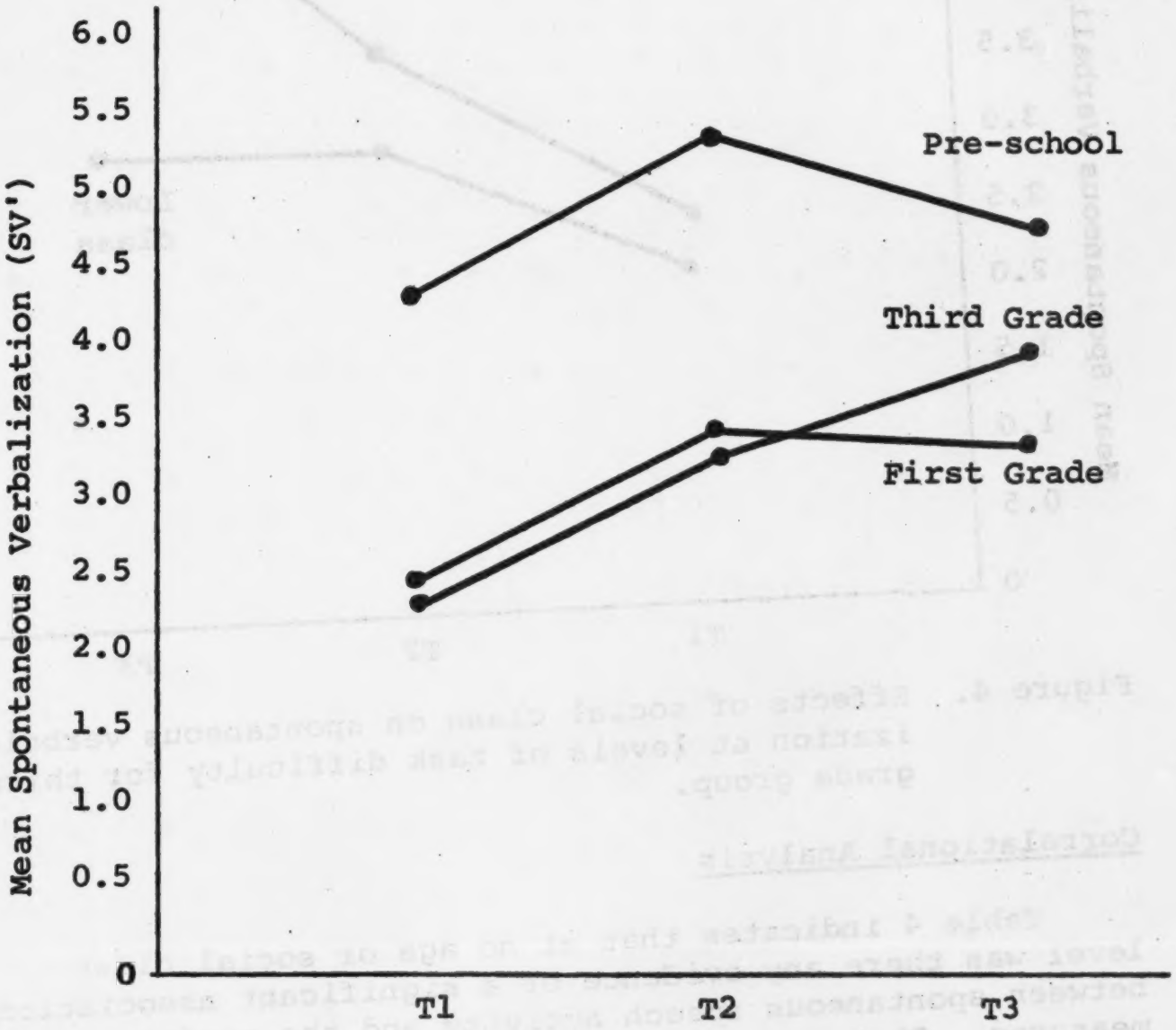

Figure 3. Effects of task difficulty on spontaneous verbalization at three grade levels.

However, the increase in verbalization from a moderate to a difficult task stems primarily from the performance of the middle class third graders (See Figure 4).

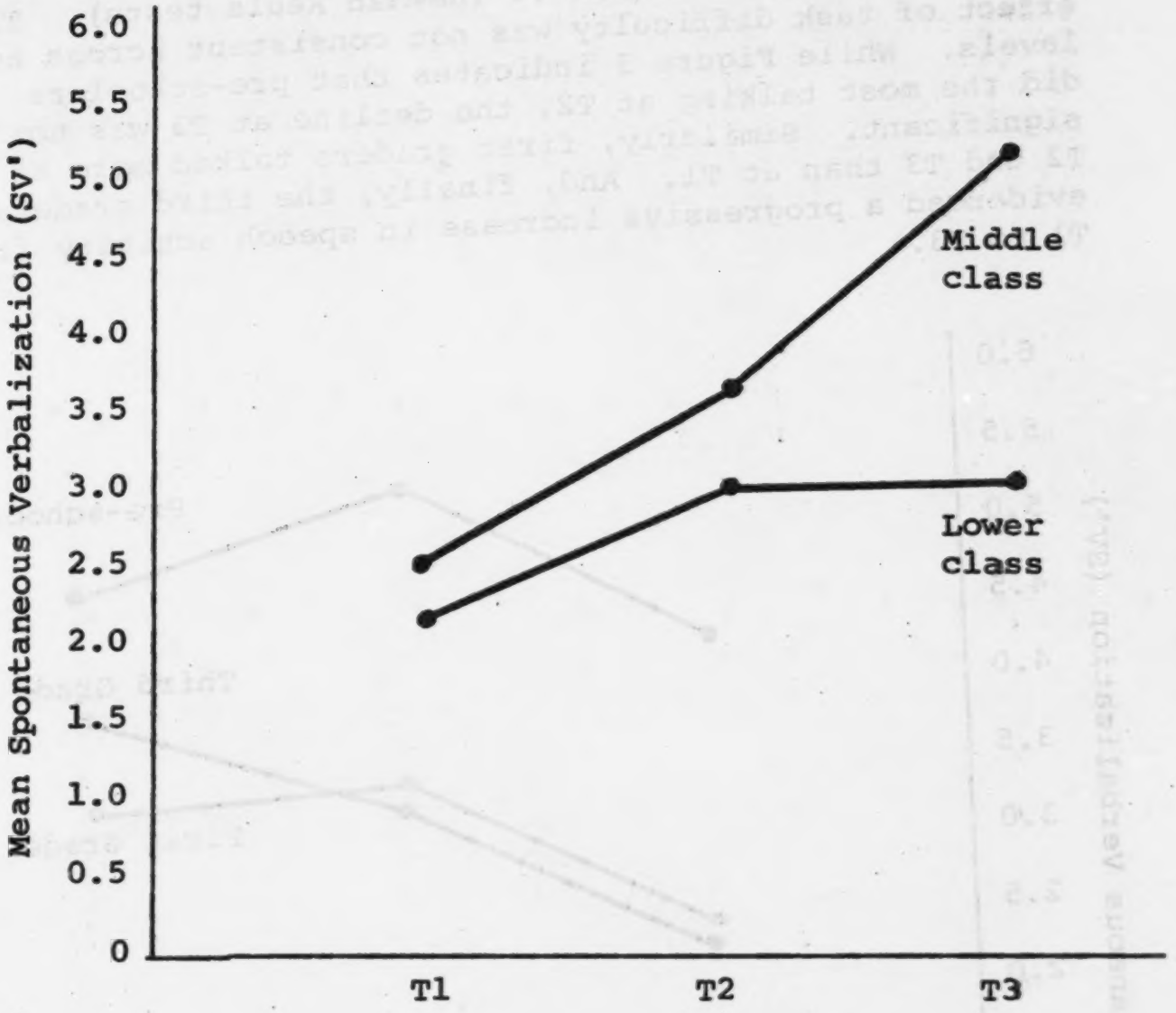

Figure 4. Effects of social class on spontaneous verbalization at levels of task difficulty for third grade group.

Correlational Analysis

Table 4 indicates that at no age or social class level was there any evidence of a significant association between spontaneous speech activity and the performance measures. That is, the level of verbalization had no apparent effect on sorting performance or the explanatory statements for this performance.

TABLE 4

INTERCORRELATIONS (RANK ORDER) BETWEEN PEABODY PICTURE VOCABULARY TEST (PPVT), AUDITORY RECEPTIVE SUBTEST (AR), SPONTANEOUS VERBALIZATION SCORES (SV), NON-VERBAL SORTING PERFORMANCE (SP), AND STATEMENTS OF A VERBAL PRINCIPLE (VP), AT GRADE AND SOCIAL CLASS LEVELS.

		Pre-school			First Grade			Third Grade		
		SV	SP	VP	SV	SP	VP	SV	SP	VP
MIDDLE CLASS	PPVT	+.28	+.19	+.10	+.05	-.15	-.22	+.10	-.27	+.06
	AR	+.03	+.18	+.28	+.16	+.19	-.05	+.25	-.34	-.11
	SV		-.04	-.17		-.27	+.31		-.08	-.19
	SP			+.54*			+.27			+.54*
LOWER CLASS	PPVT	-.18	+.62**	+.62**	-.10	+.15	+.46*	+.04	-.10	+.23
	AR	-.17	+.44*	+.74**	+.01	+.29	+.51*	+.06	+.27	+.03
	SV		-.12	-.19		+.12	-.07		+.16	+.21
	SP			+.63**			+.64**			+.55*

* $p > .05$
** $p > .01$

There was a positive association between the Ss sorting performance and verbal explanation for the performance. While it might be expected that "successful sorters" would be more capable of verbalizing a classification principle than "non-successful sorters," the correlations were only moderate, ranging from .54 to .64. There were, apparently, a number of Ss who could sort without the ability to express verbally the reason for their solutions.

Finally, there was a significant trend among the lower class Ss on the measures of receptive vocabulary development and the verbal and nonverbal measures of sorting performance. While both vocabulary measures were significantly associated with sorting performance at the pre-school level, there appears to be a systematic decrease in this association with increasing age.

DISCUSSION

Social Class Differences

The results of this study indicate that lower socio-economic status children lag behind their middle class age-mates in the development of basic language and problem solving abilities. Lower class children were less effective in sorting pictures of objects into appropriate categories, and in expressing a verbal explanation for their classifications. While these differences have been well documented by previous research (John, 1963; Deutsch 1965; among others) the present study also found that lower class children were less inclined to generate task-related, non-social speech spontaneously. That is, from one point of view, the lower class child fails to make use of language cues as an integral part of his problem solving performance.

The observed social-class differences in language output were consistent with Bernstein's (1960) description of middle and lower class linguistic codes. The lower class child's comparative reluctance to engage in spontaneous speech activity may very well stem from the

"restricted" linguistic interactions characteristic of his subculture. The resultant limitations in self-guiding language productivity has been said to be responsible for the disadvantaged child's under developed verbal or cognitive mediational development which leads to deficits in his school achievement and more general cognitive advancement (Bernstein, 1960; Deutsch, 1965; Jensen, 1966). The thrust of this argument has been examined by Kohlberg (1969) who, in his review of the relevant theory and research, concluded that while language development appears to be intimately related to intellectual growth, there is insufficient evidence to conclude that language development is the "causal foundation of cognitive development" (p. 1044). This issue will receive additional attention in the following section.

There was only partial evidence that the impact of school experience magnified the differences found in middle and lower class linguistic competence and productivity. The developmental trends in a measure of receptive vocabulary and the ability to express a reason for sorting performance did support a "cumulative deficit" hypotheses noted in several social class comparisons of children's language and cognitive development (Deutsch, 1965; John, 1963; Klineberg, 1963). In explaining this phenomenon, Deutsch questioned the adequacy and relevance of the traditional school experience; he felt that school may, in fact, reinforce the lower class child's growing sense of failure and ineptitude. The findings of the present study, however, suggest that not all verbal and cognitive abilities are equally affected.

Spontaneous Verbalization and Problem Solving

In attempting to further assess the relationship between language development and cognitive advance, the present study has examined with particular interest a measure of nonsocial speech activity within a conceptual, problem solving situation. The interest in nonsocial speech stems from the notion that such speech may be not only a useful expression of underlying thinking (Klein,

1963) but perhaps the root of verbal thought itself (Vygotsky, 1962). Also, this language variable was seen as another useful measure of expressive output which would be influenced by differences in culturally determined linguistic codes, as defined by Bernstein (1960).

The results indicated that spontaneous, non-social speech activity is a prominent feature of the problem solving activity of pre-school children. The forms and functions of the young childrens' verbalizations were quite variable, ranging from word play to more cognitive relevant self-direction. The variety of speech forms uttered certainly casts doubt on the position that all non-communicative speech activity serves a specifically self-directive or regulative purpose, particularly in the younger children. The variety of forms produced leaves little ground for a single factor explanation of the nature of private speech. This finding is more in line with the multi-dimensional schema discussed by Kohlberg, et al. (1968). While the direction of the shift in verbalization appeared to be independent of social class, lower class children in general were less productive than their middle class age-mates.

One implication for future research of the age trends in spontaneous verbalization is that it might be more fruitful to focus on the younger children, perhaps within the three to five age range. This suggestion stems from the finding that only in the younger subjects was the speech activity truly comprehensible and amenable to meaningful classification. The older children offered a very high proportion of difficult-to-detect lip movement, the significance of which could only be inferred. In the younger children, careful attention might be given to the varieties of speech-for-self in relation to other forms of linguistic and problem-solving development. The relationship between speech-for-self and non-cognitive dimensions of behavior would also be of interest since the suggestion of internalized speech as a "self-regulator" has broad-based behavioral implications.

While the decrease in the frequency of non-social speech was predicted on the basis of both the Piaget and Vygotsky position, the shift toward more internalized speech forms (reduced intensity) was more in line with Vygotsky's view. Non-social speech does not merely vanish from the child's behavioral repertoir but can be evidenced in the more difficult-to-detect muttering and lip-movement of the older subjects. Nevertheless, the occurrence of such covert forms of speech does not necessarily confirm its self-regulative function or more general cognitive utility.

The notion that spontaneous verbalization is, in fact, an index of cognitive activity in a problem-solving situation receives some support from the finding that it does tend to modulate in accord with the cognitive demands of the task. Apparently, very easy material stimulates a minimal amount of spontaneous speech activity. As the task increases in difficulty more verbalization is elicited. Whether or not additional speech activity is stimulated at even more difficult levels seems to depend on the age and cognitive maturity of the child. Only the middle class third graders, for example, showed an increase in verbalization from the moderate to most difficult levels. The lower class third graders, on the other hand did not show a corresponding increase between the middle and most difficult levels. Their pattern of speech activity was similar to the middle class first graders and was consistent with their performance on the nonverbal sorting measure.

The fact that non-social speech becomes regulated to the cognitive demands of the task is consistent with the Vygotsky-Luria position, but in itself does not establish the regulatory nature of this speech activity. More convincing verification should come from demonstrable associations between non-social speech and performance measures. Unexpectedly, at least to a Vygotsky-Luria position, at no age or socio-economic status level was there any evidence which would suggest a simple relationship, either positive or negative, between the occurrence of spontaneous verbalization and sorting performance.

Other replications of the Vygotsky-Luria position have met with similar difficulties (Klein, 1963; Jarvis, 1968).

Perhaps, as mentioned earlier, greater clarification is needed of the various forms and functions of non-social speech; they do not appear to be equal in their problem-solving utility (Kohlberg, et al., 1968). Some forms observable at early age levels drop out with greater maturity. When grouped together, the frequency of speech-for-self has not been significantly associated with success on performance measures (Klein, 1963). The lack of utility of such gross measures is confirmed by the low correlations with performance found in this investigation (Table 4).

There is, however, reason to suspect that more specific forms of non-social speech (e.g., spontaneous stimulus labeling) may facilitate the child's performance in one problem solving situation but not in another. For example, labeling and rehearsing of stimulus names may very well aid the child in identifying, coding, and storing information essential to discrimination and memory tasks. However, spontaneous stimulus-naming may not assist conceptual problem solving unless the labels enable the child to organize stimuli into meaningful categories. Indeed, the labels offered by the younger subjects in the present study were devoid of the conceptual links which would facilitate performance. In fact, categorical labels were rarely spontaneously employed at any of the grade levels. Only after the child was questioned about the reason for his sorting was he inclined to offer the more conceptual verbalizations. Additional research is needed to determine the relationship between specific categories of non-social speech and their regulatory or problem-solving functions.

It may also be that the child's spontaneous verbalizations simply reflect or express underlying thought, as was suggested by Klein (1963). Here, the emphasis is not

on the internalization of language but on the externalization of thought. This explanation is more in line with Piaget's (1967) analysis of the language-thought interchange. Along this line there is evidence that while more cognitively-advanced children engage in more sophisticated and task-related language usage, specific language training does not necessarily result in improved problem-solving performance (Sinclair, 1967). In a more recent paper, Kohlberg (1969) concluded that "cognitive mediation requires something more than the possession and spontaneous production of verbal signs though these latter may be necessary or facilitating conditions for the former" (p. 1041). The finding that many children who could not offer verbal evidence of effective solutions, but could effectively respond on a nonverbal basis, supports this position. Similar findings have been uncovered in studies where underlying mediational process has been inferred on the basis of the child's problem-solving behavior (Kuenne, 1946; Kendler and Kendler, 1962; 1970). Within this framework, the reported age trends could be viewed as a function of insufficient inhibitory control in the younger children. As indicated by White (1965) the internalization of language and the development of inhibitory control follow parallel developmental trends in the young child. The overt speech activity, more prominent at the pre-school level, may be one of several response systems which seem to "spill over" in young children when they are faced with a problem. The development of behavioral control mechanisms, a process which Jarvis (1968) suggested develops independent of the internalization of language during the four to eight age range may very well be responsible for the drop in the frequency and intensity of private speech.

Once again, many unanswered questions remain regarding the relationship between language and thought. More recent studies (Jarvis, 1968; Klein, 1963; Kohlberg, et. al., 1968), including the present research, cast doubt on the Vygotsky-Luria notion that the child's speech-for-self is exclusively responsible for his developing regulatory control and cognitive guidance. The present state of research in this area seems to be still in that stage of

groping for meaningful strategies to attack the problem. If this be the case, it seems premature for educators to devise programming based on the notion that increasing language skill is the crux of all intellectual and educational achievement.

Conclusion

The present study focused on the spontaneous verbalization of young children to assess its value as a relevant dimension of cognitive development. Vygotsky's notion that non-communicative speech serves the child's cognitive self-guidance received some support from the findings where they indicated greater internalization with age and modulation of frequency as a function of task difficulty. However, the absence of any association between spontaneous verbalization and the child's problem-solving performance casts doubt on the directive function of such verbal activity, at least as employed within a sorting task situation. An alternate explanation was that the non-social speech is, at most, expressive of underlying thought and is overt in the young child because of his insufficient inhibitory control, an explanation more consistent with the Piaget analysis.

The diminished verbal productivity of lower class children is consistent with previous comparisons of middle and lower class linguistic productivity. These differences in the expressive language function may very well stem from the differential linguistic codes which Bernstein attributes to the middle and lower class pattern of verbal interaction. The full meaning and effect of these differences in expressive language remains a complex but essential question for future research.

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